

RESEARCH DEPARTMENT

**TRANSMITTING AERIALS FOR THE MELVAIG V.H.F. TELEVISION  
AND V.H.F. SOUND STATION**

Technological Report No. E-114/9  
(1965/26)

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for Head of Research Department

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## TRANSMITTING AERIALS FOR THE MELVAIG V.H.F. TELEVISION AND V.H.F. SOUND STATION

### INTRODUCTION

The Melvaig relay station came into operation on 26th April 1965. It provides a television and v.h.f. sound service to the Isle of Lewis, the north and north-east coastal areas of the Island of Skye, and some coastal regions of Sutherland, Ross and Cromarty.

### SUMMARY OF INSTALLATION

- Site: The site is at Maol Preac, 2.2 miles (3.5 km) north north-east of Melvaig, grid reference NG 757900, height 910 ft (277 m) a.m.s.l.
- Support Structure: The support structure consists of a 4 ft (1.22 m) square section stayed mast with an overall height of 160 ft (48.8 m), oriented with one stay along a bearing of 31° ETN. The tower is parallel sided over its whole length, but is concentrically enclosed by a 6 ft 6 in (1.98 m) outside diameter metal cylinder between the levels 63 ft (19.2 m) and 127 ft (38.8 m). The mast is screened on all faces by horizontal 0.5 in (12.7 mm) diameter rods at 6 in (154 mm) vertical separation between the levels 31 ft 6 in (9.6 m) and 58 ft 6 in (17.8 m).
- General Arrangement: See Fig. 1.
- Band I
- Channel: Channel 4 with vertical polarization is used. The vision and sound carrier offsets are both +16.875 Kc/s.
- Aerial: The aerial<sup>1</sup> consists of four tiers each of two vertical dipoles mounted on bearings of 8° and 308° ETN and spaced 7 ft 2 in (2.19 m) from the axis of the cylindrical section of the mast. The inter-tier spacing is 16 ft (4.89 m) and the

mean aerial height is 95 ft (29 m) a.g.l. The tiers are fed with equal currents and the phases are progressively retarded by  $19^\circ$ . The relative phasing for tiers 1, 2, 3 and 4 is  $0^\circ$ ,  $-19^\circ$ ,  $-38^\circ$  and  $-57^\circ$  respectively, the tiers being numbered from the top. There are independent main feeders to each tier.

Power: The total transmitter power is 2 kW which is obtained from four 500 watt amplifiers each feeding independently one tier of the four-tier aerial.

Templet and horizontal radiation pattern (h.r.p.):

See Fig. 2 and note 1.

Vertical radiation pattern (v.r.p.):

See note 2.

Gain:	Mean intrinsic gain	6.6 dB
	<u>Deduct:</u> losses due to possible misalignment and distribution feeders.	<u>0.1 dB</u>
	Mean net gain	6.5 dB
	<u>Deduct:</u> loss in main feeder (type HM 11)	0.4 dB
	network loss	<u>0.6 dB 1.0 dB</u>
	Mean effective gain	<u>5.5 dB</u>

## Band II

Carrier frequencies: 89.1 (Light), 91.3 (Third), and 93.5 (Scottish Home) Mc/s.

Aerial: The aerial<sup>1</sup> consists of four tiers each of a single horizontal dipole mounted on a bearing of  $335^\circ$  ETN, spaced 5 ft 10 in (1.77 m) from the mast-axis and fed with equal co-phased currents. The inter-tier spacing is 5 ft 5 in (1.65 m) and the mean aerial height is 45 ft (13.7 m) a.g.l. There are independent main feeders to each dipole.

Power: The total transmitter power for each programme is 4 kW which is obtained from four 1 kW amplifiers. Each amplifier is fed independently to one tier of the four-tier aerial.

Templet and h.r.p.: See Fig. 3 and note 3.

Gain:	Mean intrinsic gain	3.6 dB
	<u>Deduct:</u> losses due to possible misalignment and distribution feeders	<u>0.2 dB</u>

Mean net gain	3.4 dB
<u>Deduct:</u> loss in main feeder (type HM 11)	0.2 dB
network loss	<u>0.8 dB 1.0 dB</u>
Mean effective gain	<u>2.4 dB</u>

Programme Links:

The television programme is obtained by means of a microwave link from Glen Docherty, an intermediate site where the transmissions from Rosemarkie are received. The v.h.f. sound programmes will ultimately be obtained by direct pick-up of the transmissions from Skye (Skriaig) when this station comes into service. (Initially only the Home Service is being transmitted, the programme being obtained by a temporary u.h.f. link from Glen Docherty).

Notes:

1. The preliminary aerial design was based on a theoretical prediction of the h.r.p., the effect of re-radiation from stay wires being neglected. Small scale model measurements were made to obtain confirmation. The measured pattern is shown on Fig. 2.
2. The effective e.r.p. of the Band I aerial in the principal area of service on the Isle of Lewis is modified by the slope of the ground away from the site in this direction. Calculation showed that an improvement of 0.6 dB in the distant field should be achieved by progressively retarding the phase of the currents in each tier by 19°. Appropriate adjustments were made on site and comparative measurements of field strength on the Isle of Lewis confirmed the expected increase of approximately 0.6 dB.
3. The aerial design was based on the theoretical h.r.p. using an equivalent cylinder for the mast. An accurate h.r.p. was obtained from small scale model measurements. (See Fig. 3).

REFERENCE

1. Detailed information on the construction and dimensions of the aerials is given on the following drawings held by BBC Planning and Installation Department.

P.I.D. 9023.2.21AO General Assembly of Band I and Band II Aerials on Mast

P.I.D. 9023.2.22AO Band I Dipole Assembly

P.I.D. 9023.2.23AO Band II Dipole Assembly

SMW

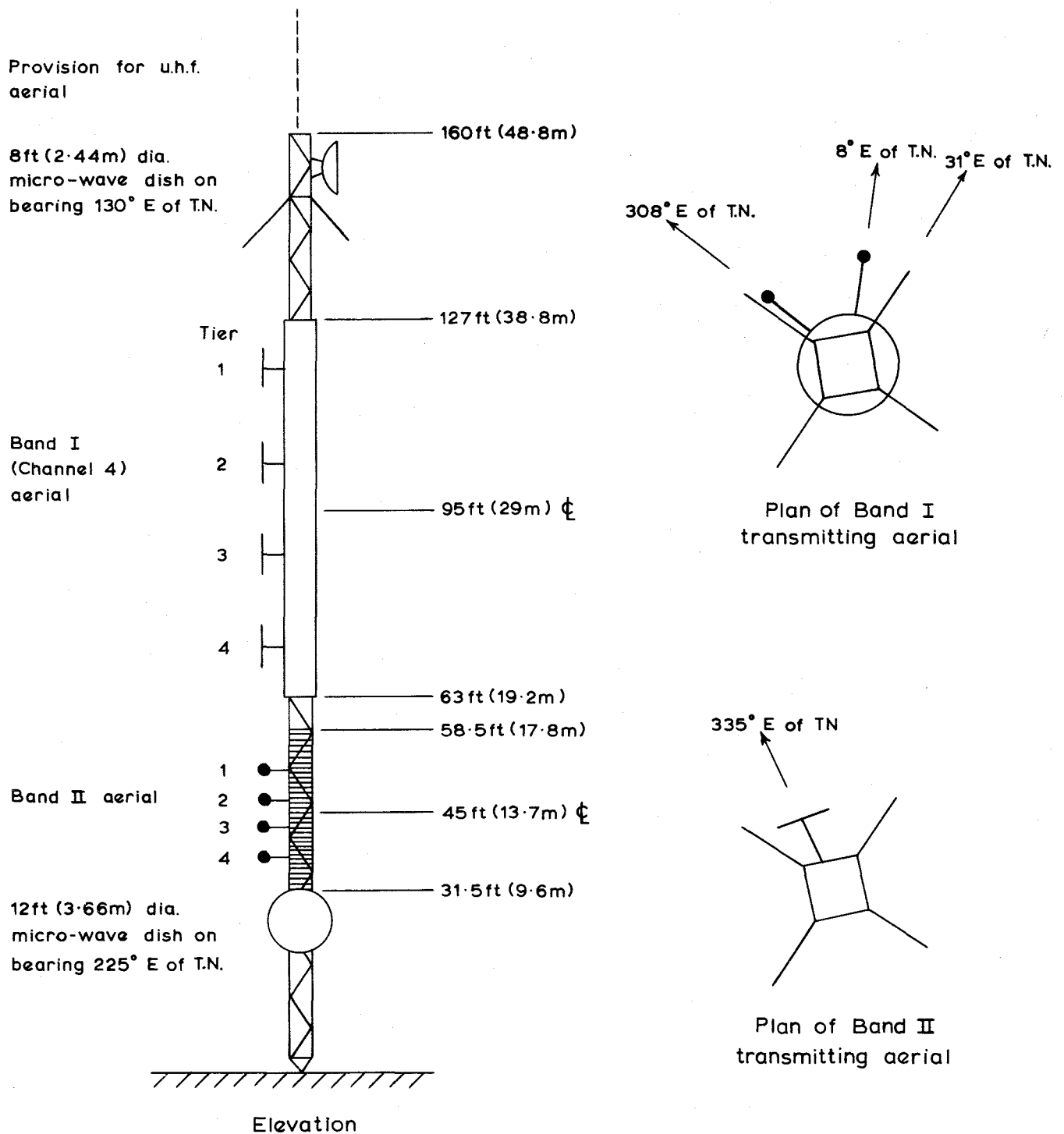
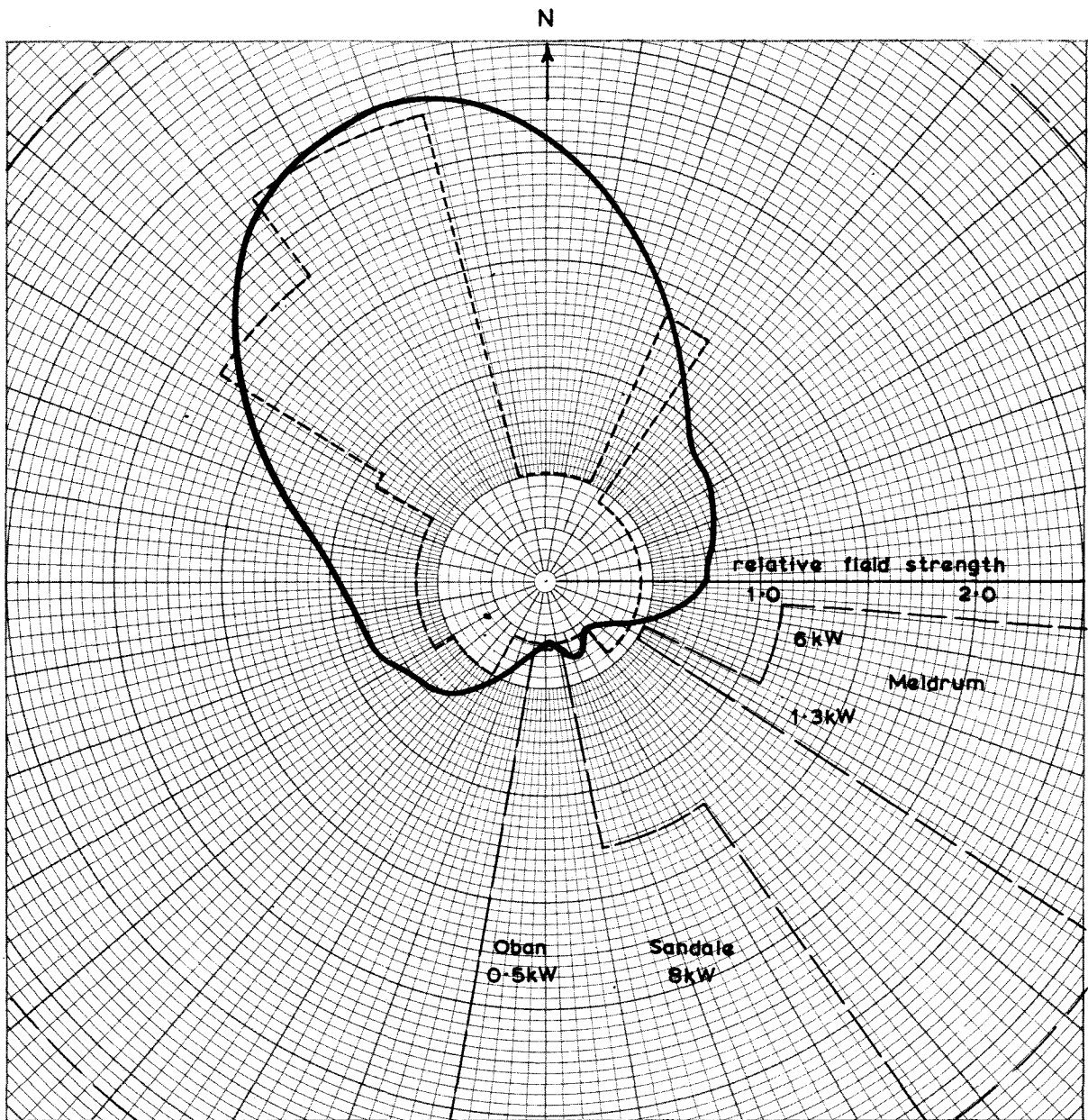


Fig.1. General arrangement of aerials on mast



**Fig. 2 Band I templet and horizontal radiation pattern**

**VERTICAL POLARIZATION**

Channel 4 (Vision carrier 61.75Mc/s, Sound carrier 58.25Mc/s)

Mean effective gain 5.5dB ———— Maximum permissible E.R.P.

Transmitter power 2.0kW (50kW where not indicated)

Mean E.R.P. 7.1kW ----- Minimum desirable E.R.P.

Unit field corresponds to an E.R.P. of 5kW.

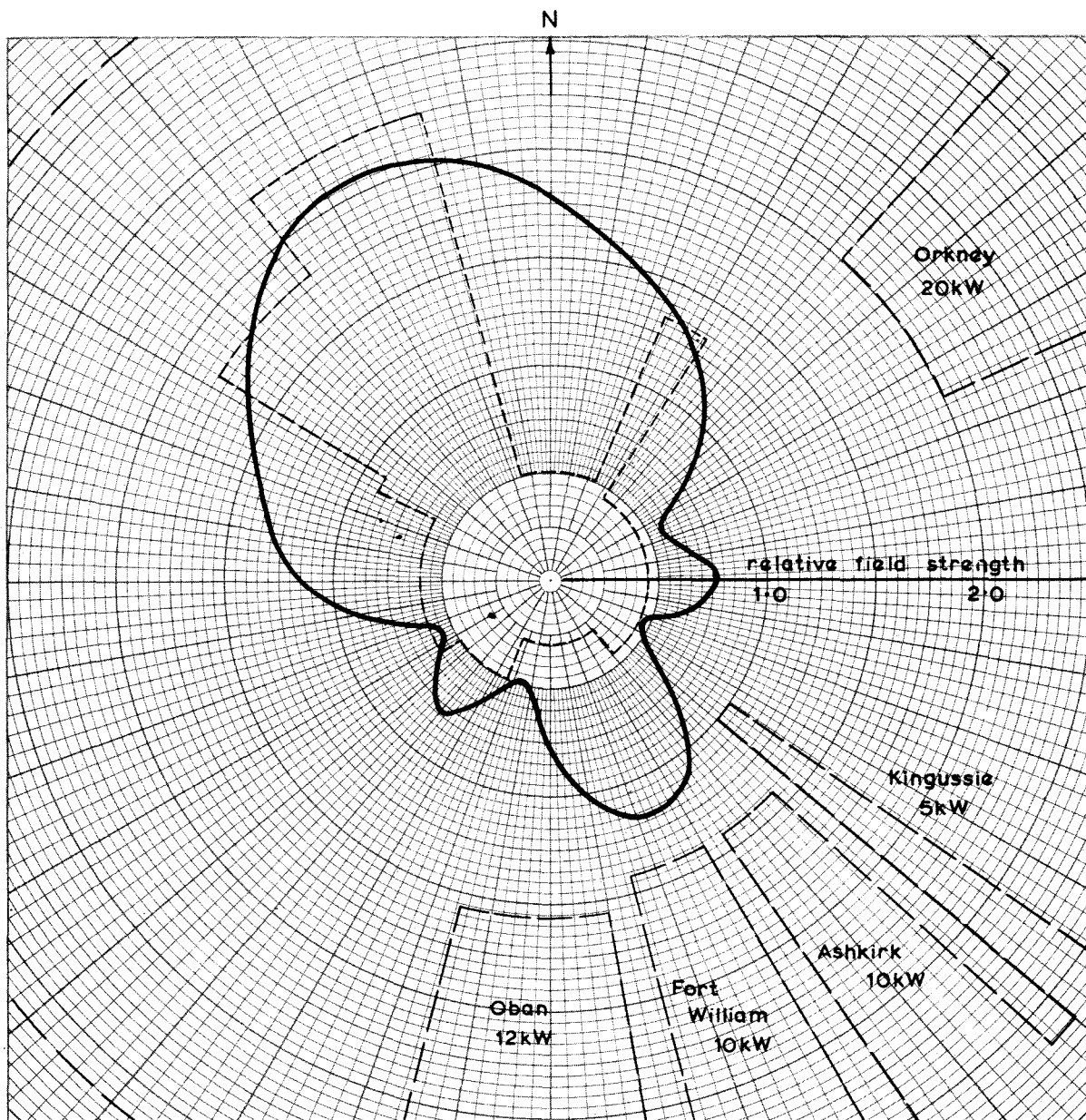


Fig. 3. Band II templet and horizontal radiation pattern.

HORIZONTAL POLARIZATION

89.1 (Light), 91.3 (Third), 93.5 (Home), Mc/s

Mean effective gain 2.4dB

Transmitter power 4.0kW

Mean E.R.P. 7.0kW

Maximum permissible E.R.P.

(50kW where not indicated)

Minimum desirable E.R.P.

Unit field corresponds to an E.R.P. of 5kW